IRSE Merit Award: Colin White

By Colin Porter

As readers will know, from time to time the IRSE presents Merit Awards to those who have been nominated by members to recognise a significant contribution to the work of the Institution. A recent recipient was Colin White, a long standing Fellow of the Institution, who works for London Underground, as he has done throughout his whole career.

Colin was originally nominated back in 2008 when the awards were introduced, for his membership and chairmanship of the Institution's Examination Committee, going back for very many years. Every year the members of this committee set the questions for the Institution's professional examination held in October and then mark the papers, something that they all do on a voluntary basis.

For some reason, lost in the mists of time, the award was not actually presented then, and when Colin was re-nominated in early 2015, for exactly the same reasons (although he had by then handed over the chairmanship to others), the nomination rang a bell in my mind. I was able to find the original engraved plaque for his award, which he was finally united with at a small celebration with his work colleagues held at Templar House in London at the beginning of August 2015, when I presented Colin with his award on behalf of the President and Council.

Colin Porter (left) and Colin White (right).
Photo: Jerry Carter.

SWISS SECTION

Train Protection for Non-interoperable Railways

By George Raymond and Brian Smith

Thirty-one members and guests of the IRSE Swiss Section gathered in Olten on 19 June to hear talks on train protection for railways that don't exchange trains with the mainline network. We also heard about solutions for low-traffic lines that are interoperable but can't afford mainline signalling.

Track gauge, loading gauge or electrification may separate non-interoperable railways (NIRs) from the mainline network. Metros' dense traffic tends to make them NIRs as well. In Europe, NIRs will not migrate to ETCS. Most Swiss NIRs are metre gauge, but some are less-than-metre or indeed standard gauge, such as the Rigi Railway.

NON-INTEROPERABLE LINES IN SWITZERLAND

The event's lead organiser was Rolf Gutzwiller of eduRail, who explained the introduction of train protection in Switzerland in the 1930s based on the Signum magnet, which on Swiss main lines is now being replaced by a Eurobalise controlled from an ETCS lineside electronic unit (LEU). He also noted that Swiss NIRs seem set to continue for decades with lineside signalling when some comparable lines elsewhere already have cab signalling.

Wolfgang Hüppi of the Swiss Federal Office of Transport (BAV) presented ZBMS, the regulation on train protection for NIRs that BAV issued in 2013. BAV did so in view of the rising numbers of trains and passengers on such Swiss lines and after consultation with the involved railways. Train protection may be needed on NIRs to raise speeds, which sometimes exceed 100 km/h, or to increase capacity, for example by allowing simultaneous entry into passing loops or automatic route setting.

A central goal of ZBMS is to make NIRs interoperable with each other by using standard ETCS components and thus to save money. ETCS standardisation lets one NIR lend or sell vehicles to another and allows through running on adjacent NIRs and dual-gauge sections. It also promises standard interfaces, tested products, faster implementation, cheaper replacement parts produced on a larger scale, and long-term support by a number of vendors. Only Siemens supports ZBMS for the moment, however.

In 2014, BAV had each of the Swiss NIRs submit a risk analysis showing that its train protection scheme keeps risk acceptable. Given that overly strict general rules might close some lines, BAV deliberately avoided defining a rigid 'acceptable risk level' in order to allow appropriate consideration of each case.

RHAETIAN RAILWAY AS SYSTEM LEADER

At the start of 2015, BAV designated the Rhaetian Railway (RhB), Switzerland's largest NIR, as 'system leader' for ZBMS just as Swiss Federal Railways (SBB) is ETCS system leader for Swiss mainline railways.

Pierre-Yves Kalbfuss of RhB explained that the basis for ZBMS is ETCS Level 1 Limited Supervision (L1 LS). ETCS is "too big to die" and thus provides a stable basis for ZBMS, which prescribes ETCS components for the air gap between track and train, including Eurobalise, Euroloop and corresponding vehicle equipment. Unlike ETCS, however, ZBMS uses no cab signals and requires that the driver need do nothing at a transition between equipped and non-equipped sections. ZBMS goes beyond standard ETCS L1 LS to cover control during train reversal and shunting, and when entering and leaving rack sections.

As a general rule, ZBMS requires that NIRs install train protection that – as a minimum – stops a train after passing a signal at danger. On the basis of its risk analysis, each NIR must identify locations where the overlap after the signal is too short. Such locations merit ETCS components that continuously monitor a train approaching a restrictive or danger aspect and stop the train before it reaches the signal. High-risk signals may for example be closely spaced, stand on a downhill section or protect the exit of a passing loop.

As part of its migration plan, which includes renewal or retrofitting of vehicles, the NIR must also decide whether, where and when to remove the old train protection system (often magnets) for non-equipped vehicles.

As ZBMS system leader, RhB is piloting the development of technical rulebooks and standard braking curves. A big issue is allocating the cost of ZBMS between the infrastructure operator and the train operator, whose sources of financing often differ.

REPRIEVE FOR AN ALTERNATIVE

Markus Enzler of the Berne - Solothurn Regional Railway (RBS) described the ZSL 90 system from Siemens that protects trains by means of a leaky feeder between the rails. ZSL 90 was introduced in the 1990s on the RBS, WSB and Forchbahn railways in Switzerland and later on the standard-gauge, 160 km/h Kuala Lumpur airport line. ZSL 90 monitors a train and stops it before it reaches a signal at danger. A cab display shows current and allowed speed.

RBS runs 550 trains daily on its trunk line between Berne and Worblaufen. ZSL 90 also covers shunting movements in Worblaufen, which are frequent around rush hours. No train has ever passed a ZSL 90 signal at danger. And reliability continues to exceed expectations despite the system's age. But Siemens may stop supporting the current ZSL 90 technology in coming years. In summer 2014, RBS, WSB and Forchbahn therefore asked Siemens to re-engineer ZSL 90 and replace its hardware and software by 2020. ZBMS remains a long-term option.

LEVEL 3 IN SWEDEN, KAZAKHSTAN AND ZAMBIA

Andreas Jonas of Bombardier presented his company's Interflo 550 implementation in Sweden, Kazakhstan and Zambia.

ERTMS Regional is a solution for interoperable lines that can't afford main line signalling. Bombardier implemented ERTMS Regional with the company's Interflo 550 platform and GSM-R on Sweden's 123 km Repbäcken - Malung line. It is devoid of signals, track circuits and axle counters except at one station. Lineside equipment is limited to 350 passive ETCS balises, and object controllers for point machines and level crossings. The controllers link to the central system by radio or cable depending on location. At present, the line's fixed blocks see some eight freight trains a day. ERTMS Regional eliminated the need for a person at each station, cut the cost of resignalling by 50% and is compatible with trains equipped for ETCS Levels 1 and 2.

In Kazakhstan, Bombardier is implementing Interflo 550 with TETRA radio in pilot projects on the 146 km Uzen - Bolashak and 293 km Korgas - Zhetygen lines. Both of these single-track lines have ETCS Level 3 moving block. A train integrity monitoring system (TIMS) at the train's end is equipped with GPS, a brake-line pressure gauge and a radio link to the head-of-train unit, which is linked to the train protection system. Bombardier is also implementing Interflo 550 on Zambia's 980 km Chingola-Livingstone line. To avoid theft and vandalism there, all communication is by microwave.

Interflo 550 allows a work crew to enter a speed restriction on a hand-held terminal at the 'last moment' before starting work.

High-risk signals often stand on downhill sections or protect the exit of passing loops. This is Rhaetian Railway's Alp Grüm station on 16 July 2014. *Photo: Markus Giger.*

Harsh mountain conditions require train protection on the Rhaetian Railway, the system leader for ZBMS. This is Ospizio Bernina (elevation 2253 m) on 15 February 2014. *Photo: Pierre-Yves Kalbfuss.*

Siemens' ZSL 90 train protection from the 1990s has earned a reprieve on Berne-Solothurn Regional Railway (RBS), but ZBMS remains a long-term option. *Markus Enzler* captured Worblaufen station, where three routes converge, on 14 December 2012.

An RBS train from Berne arrives in Solothurn on 15 January 2011. The antenna cable of the ZSL 90 train protection is visible between the rails. *Photo: Markus Giger.*

Future possibilities include:

- ETCS Level 3 as an overlay in which trains with TIMS will use L3 and all others L2,
- linking ETCS L3 with systems that pace trains to optimise energy use and traffic flow, and
- GPS positioning.

GPS IN AUSTRIA

Franz Kaiser of Siemens described applications of his company's Trainguard STC system on two Austrian NIRs. STC stands for satellite-based train control. The system mostly uses ETCS components.

A train uses GPS, its odometer and fixed RFID transponders – not Eurobalises – to know where it is along the line. The transponders also show which track the train is on. Both the train and the central system independently monitor the train and can stop it. The system can post temporary speed limits or flag an out-of-order level crossing. It also prevents vehicles from leaving shunting areas when they shouldn't. Train integrity monitoring is automatic for multiple-unit trains; on other trains, the driver or guard pushes a button after a visual check at each station.

Trainguard STC has been in operation since 2006 on the 59 km Linz local railway (Linzer Lokalbahn) and since 2011 on the 53 km Pinzgauer Lokalbahn in Austria's Pinzgau mountains. On the latter line, which had been threatened with closure, all vehicles, including work machines and a steam locomotive, are equipped. Trains typically run on 15 minute intervals and communicate every 20 seconds with the control centre. A future project is to integrate level crossings to reduce cabling.

CBTC FOR METROS

Bernard Stamm of Siemens described his company's Trainguard MT (Mass Transit) platform for communications-based train control. CBTC systems are usually proprietary systems for closed networks. On such a network, the customer is free to do what he wants, but this freedom can be costly. Trainguard MT is a high-performance signal system for metro and other lines with very short headways. It can easily support energy-optimised running. Trainguard MT normally uses ETCS-based components, but is customised for each network.

CBTC is appropriate for NIRs with dense shuttle traffic and a homogenous vehicle fleet. Mr Stamm described each metro line in Paris as a separate network. Trainguard MT equips Paris metro line 1, which went driverless in 2012 after 112 years of driver operation. Trainguard MT also provides CBTC in the Bosporus tunnel in Istanbul, where local urban trains run on moving blocks and other trains on fixed block. The same concept could be applied in Switzerland on the core section of the Zurich S-Bahn or the proposed shuttle trains to carry road vehicles through the new Gotthard rail tunnel during refurbishment of the road tunnel.

Trainguard MT uses standard ETCS components except for WLAN technology instead of GSM-R. WLAN access points are every 200 to 400 metres in tunnels and 300 to 600 metres outside. Mr Stamm said that CBTC systems require high bandwidth and a homogeneous vehicle fleet, preferably of new vehicles to avoid retrofit cost. The operator must also be ready to deal with a single vendor; unlike ETCS, CBTC systems are not further developed by a neutral third party.

A CONCLUSION

Swiss Section President Daniel Pixley noted that NIRs offer the chance to try new signalling solutions. Common challenges include migration and minimising lineside equipment. Standardisation among operators can save NIRs money.

The authors thank the speakers for their help in preparing this article.